Course Syllabus

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Course Overview & Format

This class gives students a background and some familiarity with measurement for environmental assessment. The focus of the course is detection, sampling, and analysis of chemical hazards in different samples from occupational or environmental settings. This is an introductory course, potentially leading to more specific courses on sampling and analysis of air, water, wastewater, marine samples, soils, and occupational hazards.

Prerequisites

General Chemistry.

Learning Objectives

By the end of this course, students will demonstrate the ability to:

1. Identify literature sources of standard methods for environmental and occupational assessment of chemical contaminants, and provide a framework for method selection.
2. Develop and apply a sampling strategy to adequately characterize chemical contaminants in air, water, and solid environmental media.
3. Describe basic concepts in quality control and quality assurance for chemical measurement data.
4. Critically evaluate the reliability of chemical measurement data.
5. Develop analysis plans for measurements of four different chemical contaminants in environmental and occupational samples. Your analysis plans will include selection of appropriate analytical methods and design of appropriate experimental procedures to ensure reliable data
6. Recognize the operating principles, advantages and limitations of several kinds of currently-used semi-quantitative field indicators. Demonstrate proficiency in the use of these devices.
7. Recognize the operating principles, advantages and limitations of several kinds of currently-used field meters for chemical agents. Demonstrate proficiency in the use of these devices.
8. Demonstrate knowledge of the operating principles, advantages and limitations of several kinds of laboratory instruments used for chemical analysis, including: FTIR, UV/visible absorption spectrometers, gas chromatographs, and atomic absorption spectrometers. Demonstrate proficiency in the operation of these devices.
9. Demonstrate the ability to work effectively and co-operatively as part of a team.
10. Demonstrate competency in technical writing.

11. Describe health hazards associated with at least four important chemical agents found in environmental and occupational settings, and hazards associated with the analytical procedures used to measure those contaminants.

ACCREDITATION REQUIREMENTS & COMPETENCIES MET BY COURSE

Council on Education for Public Health (CEPH) competencies met by this course include:

D-10-1 Public Health Domains

- **Role and Importance of Data in Public Health**: Address the basic concepts, methods, and tools of public health data collection, use, and analysis and why evidence-based approaches are an essential part of public health practice
- **Determinants of Health**: Address the socio-economic, behavioral, biological, environmental, and other factors that impact human health and contribute to health disparities (this course covers environmental factors impacts on human health and health disparities)
- **Project Implementation**: Address the fundamental concepts and features of project implementation, including planning, assessment, and evaluation
- **Health Communications**: Address the basic concepts of public health-specific communication, including technical and professional writing and the use of mass media and electronic technology (this course covers technical writing)

D13-1 Concepts

- Research methods

Textbooks & Readings

There is no required text for this course, however the following texts are recommended:

- *Quantitative Chemical Analysis,* 7th, 8th or 9th edition, by Daniel C. Harris. Available through UW Libraries.
- *Fundamentals of Environmental Sampling and Analysis* by Chunlong Zhang, Hoboken, N.J: Wiley-Interscience, 2007, available as eBook through UW Libraries.

Course Website

All materials, assignments, etc. for this course will be available through the Canvas course website.

Student Assessment

The overall course grade will be based on:

10% Pre-labs

20% Assignments

30% Lab Reports

10% Class participation

30% Final exam

Pre-labs (10%): Pre-labs are designed to prepare students for conducting the laboratory experiments. Pre-lab quiz questions will be emailed to students by the Friday prior to starting each lab module. The questions can be answered by reading the lab or lecture materials, or additional resources posted on the lab Module of the course website.

Assignments (20%): Weekly problem sets are assigned to assess your understanding of the theoretical material covered in the lecture sessions, and your ability to apply those concepts to environmental and occupational exposure scenarios.

Lab Reports (30%): Each lab group prepares a report and receives a collective grade for each of the lab modules. Specific roles and responsibilities are outlined in the “Round-robin: Groups & Roles” handout. Each of the four lab reports counts equally towards the total grade. Note that lab reports are substantial documents, typically 10-20 pages in length and require substantial out-of-class time commitment to summarize, process, interpret and report your experimental findings. Students are expected to reference all work and give appropriate attribution for all materials cited, including any reference to websites or articles. To aid in preparing these group lab reports, students also upload draft sections of the lab reports for review by your peers and the TAs, and review draft lab report sections provided by your lab group peers.

Participation (10%): Students are graded individually on class and laboratory session participation. Ways to earn these points include asking questions in class, actively contributing to laboratory sessions, submitting lab-section write-ups and peer reviews on time, and promoting teamwork in lab groups. **Please notify the course instructor, your group-mates and the TA, if you will not be able to attend a class due t illness, or other exceptional circumstances.** Keep in mind that, every time you are late or absent, you place a burden on your team members to fulfill your assigned role.

Common Courtesy: Part of the quality of your participation is your being responsible for managing your workspace and materials. That means cleaning up after yourself, labeling all materials you will leave in the lab between sessions, and cooperating with classmates in sharing the lab resources including bench space. Untidy, unsafe, or disruptive behavior will be noted and will affect your final "Participation" score.

Final Exam (30%): Students are graded individually on completion of an in-class final exam. This is a closed-book and closed-note exam. Students must bring a calculator (no cell phones). The exam is composed of matching, multiple choice, story problems with calculations, and essay questions. The essay question does not change from year to year. A practice exam is posted on the course website.

Use of Electronic Devices in Class

- We expect students attending class to give their full attention to class activities; so please, no use of computers or cell phones (including texting) during class, unless needed for data analysis in lab sessions. Thank you!

Accessing TAs for Help

We recommend using the Canvas Discussion Board for questions about assignments or concepts from lecture or assigned readings (first thing to try). The TAs will be tracking the board and will provide input as needed. You are welcome to ask TAs for help during lab sessions (second thing to try), but if a need arises for more one-on-one help, you can make an appointment with one of the TAs (third thing to try), either in person during class or by email. TA email links are on the Canvas course home page.

Course Organization

Refer to the Schedule on the Canvas course site. The course consists of lectures every Monday and lab sessions Mondays and Wednesdays. The first lab session is devoted to basic techniques that will be used later in the course: preparation of standards, calibration of equipment. The remainder of the course is comprised of four lab modules: air, water, solid media, and airborne particles. Teams of approximately five students will carry out each module, which typically includes a lab preparation session, a field sampling day, a sample prep session and a lab measurement session.

Class assignments that are turned in for grading include pre-lab quizzes, draft lab report sections, peer reviews, weekly assignments and the written reports for each lab module or experiment. However, this is intended to be a hands-on course and requires preparation in the form of collecting information, planning activities, calculating standard amounts or sampling times, and each student is accountable to their team members to have done the needed preparation prior to class.

Course Summary:

Date	Details	Due
Wed Apr 2, 2025	Syllabus Acknowledgement (https://canvas.uw.edu/courses/1800708/assignments/10142923)	due by 11:59pm
Fri Apr 4, 2025	Chlorine starter lab (https://canvas.uw.edu/courses/1800708/assignments/10226954)	due by 11:59pm
Mon Apr 14, 2025	QA/QC Quiz (https://canvas.uw.edu/courses/1800708/assignments/10142896)	due by 11:59pm
Mon Apr 21, 2025	Aerosol Quiz (https://canvas.uw.edu/courses/1800708/assignments/10142897)	due by 2pm
Mon Apr 28, 2025	Gases Quiz (https://canvas.uw.edu/courses/1800708/assignments/10142898)	due by 2pm
Mon May 5, 2025	Soils Quiz (https://canvas.uw.edu/courses/1800708/assignments/10142895)	due by 2pm
Mon May 12, 2025	Chromatography Quiz (https://canvas.uw.edu/courses/1800708/assignments/10142899)	due by 2pm
Tue May 27, 2025	Spectroscopy Quiz (https://canvas.uw.edu/courses/1800708/assignments/10142900)	due by 2pm
Tue Jun 10, 2025	Final Exam (https://canvas.uw.edu/courses/1800708/assignments/10142901)	due by 8:30pm
	Individual Participation in Class (https://canvas.uw.edu/courses/1800708/assignments/10142902)	
	Lab Report A: Particles (5) (https://canvas.uw.edu/courses/1800708/assignments/10142903)	
	Lab Report A: Particles (6) (https://canvas.uw.edu/courses/1800708/assignments/10142904)	
	Lab Report B: Gases (5) (https://canvas.uw.edu/courses/1800708/assignments/10142905)	

Date	Details	Due
	Lab Report B: Gases (6) (https://canvas.uw.edu/courses/1800708/assignments/10142906)	
	Lab Report C: Lead (5) (https://canvas.uw.edu/courses/1800708/assignments/10142907)	
	Lab Report C: Lead (6) (https://canvas.uw.edu/courses/1800708/assignments/10142908)	
	Lab Report D: Water (5) (https://canvas.uw.edu/courses/1800708/assignments/10142909)	
	Lab Report D: Water (6) (https://canvas.uw.edu/courses/1800708/assignments/10142910)	
	Pre-lab A: Particles (https://canvas.uw.edu/courses/1800708/assignments/10142911)	
	Pre-lab B: Gases (https://canvas.uw.edu/courses/1800708/assignments/10142912)	
	Pre-lab C: Lead (https://canvas.uw.edu/courses/1800708/assignments/10142913)	
	Pre-lab D: Water (https://canvas.uw.edu/courses/1800708/assignments/10142914)	
	Review: Gases (https://canvas.uw.edu/courses/1800708/assignments/10142915)	
	Review: Lead (https://canvas.uw.edu/courses/1800708/assignments/10142916)	
	Review: Particles (https://canvas.uw.edu/courses/1800708/assignments/10142917)	
	Review: Water (https://canvas.uw.edu/courses/1800708/assignments/10142918)	
	Section Draft: Gases (https://canvas.uw.edu/courses/1800708/assignments/10142919)	

Date	Details	Due
	Section Draft: Lead (https://canvas.uw.edu/courses/1800708/assignments/10142920)	
	Section Draft: Particles (https://canvas.uw.edu/courses/1800708/assignments/10142921)	
	Section Draft: Water (https://canvas.uw.edu/courses/1800708/assignments/10142922)	